

App. No. 09/560,269
Amendment dated August 30, 2006
Reply to Final Office Action of June 30, 2006

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REMARKS

Claims 1, 5, 7-16, 20, 22-31, 35, and 37-45 remain in this application for further review. The claims have been amended as set forth above. Applicants assert that no new matter has been added.

I. Examiner Interview

Applicants' attorney requested an interview with Examiner Rutten. The request was denied. However, Applicants' attorney and Examiner Rutten informally spoke about the prosecution of this matter to develop a prosecution plan in order to move prosecution forward.

II. Rejection under 35 U.S.C. §112

Claims 1, 5, 7-16, 20, 22-31, 35, and 37-45 are rejected under 35 U.S.C. §112, first paragraph, as being based on a disclosure which is not enabling. Claims 1, 5, 7-16, 20, 22-31, 35, and 37-45 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicants have amended the claims as set forth above to overcome the rejections

III. Rejection under 35 U.S.C. §103(a)

Claims 1, 10-12, 16, 25-27, 31, and 40-42 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,314,558 issued to Angel et al. (hereinafter "Angel") in view of "Advanced Compiler Design and Implementation" by Muchnick (hereinafter "Muchnick"). Claims 5, 7, 13, 14, 20, 22, 28, 29, 35, 37, 43 and 44 are rejected under 35 U.S.C. §103(a) as being unpatentable over Angel and Muchnick and further in view of U.S. Patent No. 6,282,701 issued to Whygodny (hereinafter "Whygodny") and further in view of U.S. Patent No. 6,438,512 issued to Miller (hereinafter "Miller") and further in view of U.S. Patent No. 6,374,369 issued to O'Donnall (hereinafter "O'Donnall"). Claims 8, 23, and 38 are rejected

App. No. 09/560,269
Amendment dated August 30, 2006
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under 35 U.S.C. 103(a) as being unpatentable over Angel and Muchnick and further in view of U.S. Patent No. 5,761,513 issued to Yellin (hereinafter "Yellin"). Applicants respectfully traverse.

Independent claim 1 has been amended to include the following combination of elements not taught or otherwise suggested by the cited references:

"eliminating the probe location at the end of the first called function and eliminating the probe location at the end of the second called function when the first called function calls the second called function and when the second called function returns to the calling function"

As one example from the specification, the specification recites as follows:

Another situation in which the normal strategy of instrumenting only the entry and exit points of functions produces potentially inaccurate results occurs in what is known as a tail merge. A tail merge is an optimization made either by a compiler or by the programmer at the machine instruction level that eliminates calls to functions by instead jumping to the next function, then having a single return statement return out of multiple functions. Figure 4 depicts an example of a tail merge situation. In Figure 4, a main function 402 calls a Function1 function 404. At a point 406, the function 404 in turn calls a Function2 function 408. At the end of this function, a return statement 410 is encountered. This return statement 410, however, returns to the main function 402. This change in flow is contrary to the expected sequence of events, in which the return statement 410 would return to the function 404, which called the function 408. Normally, another return statement would redirect execution from the function 404 back to the main function 402, which called the function 404. Because a tail merge functions similarly to a call/return pair, it should be instrumented. A CallToFunction probe 412 is inserted before the jump at the point 406, treating the jump as a call to the function 408. Since execution does not return to the point 406 after the jump, however, a ReturnFromFunction probe placed after the jump would be superfluous.

This departure from the normal sequence of events is a potential source of ambiguity in attributing time to the correct functions. Specifically, an issue arises as to the proper attribution of a time period 414 occurring after the point 406 and before the

App. No. 09/560,269
Amendment dated August 30, 2006
Reply to Final Office Action of June 30, 2006

end of the main function 402. Typically, and_ExitFunction probe would precede the return statement 410 and would indicate that program flow is exiting the function 408. This probe, however, does not convey any information as to where program flow continues after exiting the function 408. Without additional information, this time is likely to be erroneously attributed to the function 404 because the function 408 was called by the function 404, but no end point was available within the function 404 with which to properly attribute time. The time period 414, however, should be attributed to the main function 402, which is where execution proceeds after the jump. This ambiguity can be resolved in a number of ways. One way is to flag the CallToFunction probe 412 as calling a function that has a tail merge. Another way is to insert a ReturnFromFunction probe 416 at the point to which execution proceeds after the tail merge. Inserting the ReturnFromFunction probe 416 at this location clarifies the destination of the return from the function 408 when the function trace is processed." *Specification*, at page 10, line 25 through page 11, line 26.

Applicants can find no teaching or suggesting in the cited references of instrumentation as recited in independent claim 1. There is no teaching in Angel or the other references of a computer implemented method that includes a step for "eliminating the probe location at the end of the first called function and eliminating the probe location at the end of the second called function when the first called function calls the second called function and when the second called function returns to the calling function." Accordingly, applicants assert that independent 1 is allowable.

Independent claim 12 has been amended to include the following combination of elements not taught or otherwise suggested by the cited references:

"eliminating the probe location at the end of the first called function and eliminating the probe location at the end of the second called function when the first called function calls the second called function and when the second called function returns to the calling function"

Applicants can find no teaching or suggestion in the cited references of instrumentation as recited in independent claim 12. There is no teaching in Angel or the other references of computer-executable instructions that include "eliminating the probe location at the end of the

App. No. 09/560,269
Amendment dated August 30, 2006
Reply to Final Office Action of June 30, 2006

first called function and eliminating the probe location at the end of the second called function when the first called function calls the second called function and when the second called function returns to the calling function." Accordingly, applicants assert that independent claim 12 is allowable.

Independent claim 31 has been amended to include the following combination of elements not taught or otherwise suggested by the cited references:

"eliminating the probe location at the end of the first called function and eliminating the probe location at the end of the second called function when the first called function calls the second called function and when the second called function returns to the calling function"

Applicants can find no teaching or suggesting in the cited references of instrumentation as recited in independent claim 31. There is no teaching in Angel or the other references of a computer system that is arranged to execute computer executable instructions including "eliminating the probe location at the end of the first called function and eliminating the probe location at the end of the second called function when the first called function calls the second called function and when the second called function returns to the calling function."

Accordingly, applicants assert that independent 31 is allowable.

Independent claim 16 has been amended to include the following combination of elements not taught or otherwise suggested by the cited references:

"determining whether the first called function is one of: an internal called function and an external called function, and

eliminating the probe location in the calling function at the beginning of the call to the first called function and eliminating the probe location in the calling function at the end of the call to the first called function when the first called function is an internal called function"

As one example from the specification, the specification recites as follows:

"Figure 3 depicts a portion 300 of an application and its potential probe locations 302, 304, 306, 308, 310, and 312. For purposes of clarity, the potential probe locations are depicted in italic type in Figure 3. As can be seen in Figure 3, potential

App. No. 09/560,269
Amendment dated August 30, 2006
Reply to Final Office Action of June 30, 2006

locations for the EnterFunction probes 302 and 310 occur at the beginnings of a main function 314 and of a CalledToFunction function 316. Similarly, potential locations for the ExitFunction probes 308 and 312 occur at the ends of the main function 314 and of the CalledToFunction function 316.

Some of the probes can be omitted so as to collect sufficient information to perform full call attribution without collecting redundant information. At the block 204 of Figure 2, the system determines which probes can be omitted. In the specific example shown in Figure 3, the CallToFunction and ReturnFromFunction probes provide redundant information. These probes are redundant because they would supply almost exactly the same information at almost the same time as other probes. For example, the CallToFunction probe 304 in the main function 314 would supply almost the same information as the EnterFunction probe 310 in the function 316 at nearly the same time, with only a slight time difference attributable to overhead for the probe itself. Similarly, the ReutrnFromFunction probe 306 in the main function 314 would supply almost the same information as the ExitFunction probe 312 in the function 316 at nearly the same time. Thus, because the CallToFunction and ReturnFromFunction probes are redundant in this example, the potential probe locations 304 and 306 need not be instrumented, and are eliminated from consideration by the system at the block 204 of Figure 2. It is desirable to eliminate the CallToFunction and ReturnFromFunction probes because there are typically more locations that call to functions than there are functions themselves. Thus, eliminating these probe pairs removes a larger portion of the total instrumentation, while ensuring that enough information to perform full call attribution is collected.

While this strategy increases efficiency in most cases, it does not work for all cases. In particular, eliminating these probe pairs only works in the case of direct calls to functions within the current module. Thus, while instrumentation of calls within the current module can be eliminated from the list of instrumentation points, instrumentation of calls outside of the current module cannot. Eliminating these probes would case insufficient information for full call attribution to be gathered, since there is no guarantee that other modules will be instrumented. Time can be incorrectly attributed as a result. For example, referring again to Figure 3, if the function 316 were located in a different module from the main function 314, eliminating the probes at locations

App. No. 09/560,269
Amendment dated August 30, 2006
Reply to Final Office Action of June 30, 2006

304 and 306 would cause time spent in the function 316 to be incorrectly attributed to the main function 314. Thus, as a general rule, calls outside the current module are instrumented both before and after the call is performed, e.g., if the main function 314 and the function 316 were located in different modules, CallToFunction and ReturnFromFunction probes would be inserted at locations 304 and 306, respectively." *Specification*, at page 9, line 16 through page 10, line 24.

Applicants can find no teaching or suggesting in the cited references of instrumentation as recited in independent claim 16. There is no teaching in Angel or the other references of a computer implemented method that includes a step for "determining whether the first called function is one of: an internal called function and an external called function", and "eliminating the probe location in the calling function at the beginning of the call to the first called function and eliminating the probe location in the calling function at the end of the call to the first called function when the first called function is an internal called function." Accordingly, applicants assert that independent 16 is allowable.

Independent claim 27 has been amended to include the following combination of elements not taught or otherwise suggested by the cited references:

"determining whether the first called function is one of: an internal called function and an external called function, and

eliminating the probe location in the calling function at the beginning of the call to the first called function and eliminating the probe location in the calling function at the end of the call to the first called function when the first called function is an internal called function"

Applicants can find no teaching or suggesting in the cited references of instrumentation as recited in independent claim 27. There is no teaching in Angel or the other references of computer-executable instructions for "determining whether the first called function is one of: an internal called function and an external called function", and "eliminating the probe location in the calling function at the beginning of the call to the first called function and eliminating the probe location in the calling function at the end of the call to the first called function when the

App. No. 09/560,269
Amendment dated August 30, 2006
Reply to Final Office Action of June 30, 2006

first called function is an internal called function." Accordingly, applicants assert that independent 27 is allowable.

Independent claim 42 has been amended to include the following combination of elements not taught or otherwise suggested by the cited references:

"determining whether the first called function is one of: an internal called function and an external called function, and

eliminating the probe location in the calling function at the beginning of the call to the first called function and eliminating the probe location in the calling function at the end of the call to the first called function when the first called function is an internal called function"

Applicants can find no teaching or suggesting in the cited references of instrumentation as recited in independent claim 42. There is no teaching in Angel or the other references of a computer system that is arranged to execute computer executable instructions including "determining whether the first called function is one of: an internal called function and an external called function", and "eliminating the probe location in the calling function at the beginning of the call to the first called function and eliminating the probe location in the calling function at the end of the call to the first called function when the first called function is an internal called function." Accordingly, applicants assert that independent 42 is allowable.

Claims 5, 7-11, 13-15, 20, 22-26, 28-30, 35, and 37-41 and 43-45 include elements not taught or otherwise suggested by the cited references. Moreover, those claims ultimately depend from independent claims 1, 12, 16, 27, 31, and 42, respectively. As such, applicants believe that the dependent claims should be found allowable for at least the same reasons asserted for the independent claims.

IV. Request For Reconsideration

In view of the foregoing amendments and remarks, all pending claims are believed to be allowable and the application is in condition for allowance. Therefore, a Notice of Allowance is respectfully requested. Should the Examiner have any further issues regarding this application,

App. No. 09/560,269
Amendment dated August 30, 2006
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the Examiner is requested to contact the undersigned attorney for the applicant at the telephone number provided below.

Respectfully submitted,

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